

Production Technology of Sugarcane

Bengali Name: আখ/ ইক্ষু/ কুশাইল

English name: Sugarcane.

Family: Gramineae.

Species:

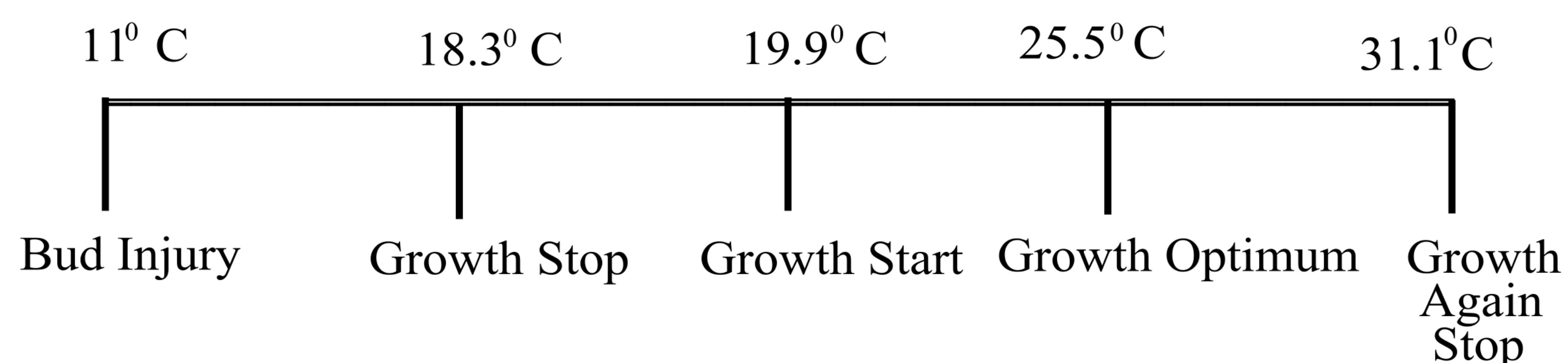
1. *Saccharum officinarum* (better cultivated)
2. *S. pinesis* (cultivated)
3. *S. spontaneum* (wild)
4. *S. barberi* (cultivated)
5. *S. robustum* (Wild)

Origin

North Eastern India (Bangladesh, Asam).

Climate

- Temperature 18-20°C for germination.
- 25-30°C for growth.
- 18-22°C for maturity.
- Crop is very sensitive to temperature. 10°C is most conducive to maximum accumulation of sugar.
- Rainfall 75-120 cm/ Year.
- Under bright sunshine the stem are thicker but shorter and leaves are broader and greener.
- Under low sunshine stems are slender and leaves are narrow and yellowish. Long day length increase tiller and produce maximum dry matter.



Soil

High and medium high lands with no water-logging condition are suitable for sugarcane cultivation. It is grown well in loam, sandy loam and clay loam soils.

Variety

Coimbatore variety- Co 419, Co 421, Co 453, Co 513, Co 527, Co 633, Co 636, Co 675, Co 1148 (best), Co 1158 (better) etc.

HYV- Isd 1/53, Isd 2/54, Isd 3/54, Isd 6/56, Isd 7/57, Isd 8/57, Isd 9/57, Isd 14/58, Isd 16, 17, 18, 19, 20, 21, 22, 25 etc.

African Variety- Latari Java C, Latari Java A, Latari Java B.

Land Preparation

4 to 5 times ploughing and laddering to make land suitable for its growth successfully.

Planting Method

1. Flat method.
2. Furrow method.
3. Trench method.
4. STP (Spaced transplantation) method.

1. Flat method: Land deeply ploughed, rolled and levelled. The furrow are then made with country plough with 3-4 cm depth which are 80-90 cm apart depending on the variety. The sugarcane sett are then planted in furrows and covered with soil wholely. The setts are placed end to end in rows.

2. Furrow method: This method consists of planting cane in furrows which 80-90 cm apart depending on the variety. The setts are planted in end to end method to a depth of 10-15 cm and covered with 5-6 cm soil, leaving upper portion of the furrow are usually made by country plough on mould board plough.

3. Trench method: It is modern improved and recommended method for HYV cultivation. In this method land should be ploughed and levelled then the trench are made with spade and left cover to weather for a month.

Size of trench- Each trench are made which have 35-40 cm wide and 40 cm depth and about 5 cm of bottom of the trench should be filled up with loose soil. The distance between the two adjacent trenches 100-120 cm depending soil type, variety and planting time.

Advantage

- Top dressing and localized placement of fertilizer is easy.
- Intercultural operation is convenient.
- Root encourage is ensure and lodging is minimum.
- Sugar percentage becomes higher.

- Yield becomes higher than other method.

Disadvantage

- It is hard laborious and costly method.
- Unskillness of labour.

4. STP (Spaced transplantation method): In this method sugarcane setts are placed in polybag or in soil bed in October/November. When land is ready, seedlings are transplanted maintaining a particular distance and irrigation is applied. Through this technique only healthy seedlings can be planted.

Advantage

- Equal spacing between plant to plant can be maintained.
- No risk of gap in the sugarcane line.
- Cane yield could be increased to desired level with optimum plants in the field.
- Pest and disease infestation is less.
- STP method is more suitable than conventional method for production of Foundation and Certified seed.
- Intercrop can be grown with STP sugarcane.
- It requires about 50% less setts.

Method of placement of sett

1. Single row method-

- End to end method without gap.
- End to end method with gap (15 cm).

2. Double row method-

- One and half method.
- Parallel method.

3. Zigzag method.

Time of planting

Sugarcane planting has been recommended as-

- i) Early planting: September to October.
- ii) Mid planting: November to December.

iii) Late planting: February to March.

Selection of Sett

- The sett should be 20-30 cm long.
- The sett should be at least 2-3 buds.
- The sett should be selected from 1/3 upper portion of the cane.
- The sett should be free from insect pest and disease.
- It should be free from adventitious roots.
- There should not be any mechanical injury on the sett.
- Age of sett should be 10-12 month of main crop and 6-8 month of ratoon crop.
- Sprouted and rotted stem should be avoided.

Different kinds of planting materials used as seed

Sugarcane can be planted using different kinds of planting materials. They are-

- | | |
|--------------------------------|-----------------------|
| • Three bud sett | • Ryungun settling |
| • Two bud sett | • Lateral shoot |
| • Bag settling | • Stalk less settling |
| • Single bud soil bed settling | • Budchip settling |
| • Double bud soil bed settling | |

Three bud and two bud setts are used for conventional method of planting while other kinds of settings are used for spaced transplantation (STP) method.

Sett treatment

Sett treatment of sugarcane is done to control seed borne diseases (Red rot, Smut, White leaf, Ratoon stunting disease etc.) and to protect the seed from soil borne pathogens (Pineapple disease, Wilt etc.). To produce disease free clean seed (Breeder/Nucleus Seed and Foundation Seed) seed treatment is a mandatory. It is normally done in two ways viz.

- Heat therapy.
- Chemotherapy.

Beside sett should be treated with Agallol/ Aretan @ 200 g/ 20 L water.

Seed Rate

▲ 30,000-35,000 setts/ha.

▲ 3- 4.5 ton/ha.

Fertilizer Application

Fertilizer	Quantity/ ha
Cowdung	8-10 ton
Urea	240-260 kg
TSP	130-150 kg
MoP	60-80 kg
Gypsum	180-190 kg

Cowdung should be applied during final land preparation. 1/3 Urea, total TSP, MoP, Gypsum should be applied during final land preparation. Rest 1/3 Urea at 15-20 Days after sett placement and remaining 1/3 Urea at 60 days after sett placement should be top dressed.

Intercultural Operation

Gap filling: Sometimes satisfactory germination may not occur after planting of sugarcane. If between 2 feet, there is no plant then there must planting should be ensured as early as possible. Again seedling may damage due to various reason. So gap should be filled with new seedlings immediately.

Hoeing: For proper ratooning and available moisture, sugarcane needs well aerated and loose soil. After heavy rainfall and irrigation the upper crust of soil become hard and air cannot enter into the soil. So root growth stopped. For this reason, hoeing is necessary during seedling stage after heavy rainfall and irrigation.

Weeding: Weeds may be grow inside the furrow or trench and in between the trenches such as durba, mutha, bathua etc. So, 2-3 weeding is need before rainy season.

Earthing up: When seedling become 60-90 cm long, earthing up to be done. Soils in between furrows or trenches are used for earthing up. Earthing up is done for following purpose-

- To enhance tillering and rooting.
- To protect the plant from lodging.
- To facilitate irrigation and drainage.

Two times earthing up may be necessary:- First at 7-8 weeks and Second 12-14 weeks of transplanting.

Irrigation

Adequate irrigation increase the yield of sugarcane. The field should be Irrigated at 1-2 months after sett planting. During drought condition in March-April irrigation is a must. Totally 5-6 irrigation is needed for sugarcane cultivation.

Insect and Disease pest

The important insects are Top shoot borer, Early shoot borer, Pink borer, Termites, white grabs, Root stock borer etc. For controlling these-

- Keep the field free from weeds to pest control.
- Apply Furadan 5G @ 40 kg/ha to control top shoot borer and pink borer.
- Destroy the termite nest and queen.
- Use light trap to catch the white grabs beetle.
- Destroy infected top shoot and plant.

The major disease of sugarcane are Red rot, Smut, Wilt, Red strip, Mosaic etc. For controlling disease-

- Use resistant variety.
- Clean cultivation should be followed.
- Complete roughing and burning of the infected clumps.
- Sett treatment with Bavistin solution (1:1000) for 30 minutes.

Special Operation

Trashing: Removal of dead, dried and old leaves (4-5 months interval) is known as Trashing. Dead leaves of sugarcane can not drop out from the stem like other crop but this leaves are harbour of insect pest and disease. Beside this, rain water stacked between leaf sheath and internode which help to germinate buds and adventitious roots. For this reason quality of cane can be increased by removal of dead and dry leaves.

Wrapping/ Tying: When sugarcane becomes 5 months old, 3-4 clumps are wrapped together. Leaves are usually used for this purpose. Lodging of sugarcane occurs reducing the growth of stem and emergence of ride bud and loosen of weight and percentage of sugar in cane. Some plant may be died. Lodging of sugarcane occurred by over rainfall or by storm. To avoid this problem each bush tied by dead and semi dead leaves of the plants. Then 2-4 bushes tied together with dead leaves. Wrapping may be necessary in 3-4 times.

Propping: After wrapping of sugarcane lodging may be occur in strong affected areas. To mitigate this problem propping is necessary. Bamboo stick put down into the soil in between two rows and tied the wrapped bush with bamboo pole by dead leaves. 2 thousand bamboo needed for one hectare of land.

Harvesting

Sugarcane should be harvested after attaining proper maturity because both yield and sugar percentage depend on proper maturity. Maturity symptoms determined by **Refractometer**. With this, % brix (solid portion) is determined. The % brix of mature cane is 20-22 % and out of it 80-90 % is sucrose.

Maturity symptoms

1. Upper leaves start drying and droopy.
2. Length of internode become short.
3. Adventitious roots emerge lower portion of the cane.
4. Metallic sound produce by striking of iron stick.
5. Stems become slightly yellow.
6. Leaves become shorter and yellowish.
7. Before Formation of inflorescence.

Time: October–March.

Yield

The average yield of sugarcane is 48 tones per hectare but upto 100 tones yield can be easily achieved through proper management.

Ratooning

The cultivated crop regrowth after harvest. Since sugarcane is a perennial plant, it can be ratooned. 2 or 3 ratoon crop may be harvested before replanting but the yield slowly decreases. After harvesting the crops old leaves present in the field have to be burnt and remove before the emergence of new plant soil between the rows. The field should be Irrigated just after harvesting and burning. The nitrogenous fertilizer require 20 % more than normal. Better variety for ratooning Isd 16 and Isd 21.

Production Technology of Sugarbeet

Scientific name: *Beta vulgaris*.

Family: Amaranthaceae.

Importance

Now tropical sugarbeet hybrids are gaining momentum in tropical and sub tropical countries as a promising energy crop and alternative raw materials for the production. The ethanol can be blended with petrol or diesel to the extent of 10% and used as bio-fuel. The sugarbeet waste material viz. beet top used as green fodder, beet pulp used as cattle feed and filter cake from industry used as organic manure.

Origin

The first modern sugarbeets originated as selections made in the middle of the 18th century from fodder beets grown in then German Silesia, but food and medicinal uses are much older.

Distribution

Sugarbeet is a temperate crop. It is widely cultivated in America, Britain, Canada, Mexico, Germany, France etc. Now hybrid varieties of sugar beet has been regarded as a commercial sugar crop of sub-tropical countries like Bangladesh, India, Pakistan etc.

Varieties

Cauvery, Indus, Shubhra, Aimanta, Trinta, Saracen, Opta etc.

Climate

Tropical sugarbeet require good sunshine during its growth period. The crop does not prefer high rainfall as high soil moisture or continuous heavy rain may affect development of tuber and sugar synthesis.

◆ The optimum temperature for germination is 20–25°C.

◆ For growth and development 30–35°C.

◆ For sugar accumulation in 25–35°C.

Soil

Well drained sandy loam and clay loam soils having medium depth (45 cm) with fairly good status are suitable.

Preparation of Land

Tropical sugarbeet require deep ploughing (45 cm) and followed by 2 – 3 ploughing to obtain a good

soil tilth condition for favorable seed germination. Ridges and furrows are formed at 50 cm apart.

Time of sowing

Tropical sugarbeet is sown in September to November.

Seed rate

The recommended seed rate is 3.6 kg/ ha. Optimum population is 1,00,000 - 1,20,000 /ha.

Spacing

The recommended spacing is 50 X 20 cm.

Seed sowing

The pelltated seed is dipped at 2 cm depth in the sides of ridges at 20 cm apart. 45 X 15 cm spacing found to be optimum for higher root yield.

Manures and Fertilizer

Fertilizer	Basal application	Top dressing
Manures	12.5 ton/ ha	
Azospirillum	2 kg/acre (10 pockets)	
Phosphobacteria	2 kg/acre (10 pockets)	
Nitrogen	75 kg/ha	37.5 kg / ha each at 25 & 50 DAS
Phosphorus	75 kg/ha	
Potassium	75 kg/ha	

Intercultural operation

Weeding: The crops should be maintained weed free situation upto 75 days. Pretilachlor 50 EC @ 0.5 Kg /ha or Pendimethalin @ 3.75 L /ha can be dissolved in 300 litres of water and sprayed with hand operated sprayer on 0-2rd day after sowing, followed by hand weeding on 25th day and 50th day after sowing.

Earthing up: The earthing up operations coincides with top dressing of N fertilizer.

Irrigation

Tropical sugarbeet is very sensitive to water stagnation in soil at all stages of crop growth. Irrigation should be based on soil type and climatic condition. Pre-sowing irrigation is essential since at the time of sowing, sufficient soil moisture is must for proper irrigation.

◆ First irrigation is crucial for the early establishment of the crop. For loose textured sandy loam soil irrigation once in 5-7 days and for heavy textured clay loam soil once in 8 –10 days is recommended.

- ◆ The irrigation has to be stopped at least 2 to 3 weeks before harvest. At the time of harvest if the soil is too dry and hard it is necessary to give pre harvest irrigation for easy harvest.
- ◆ Light and frequent irrigation is recommended for maintaining optimum soil moisture. Water requirement 800 - 850 mm.

Pest and diseases management

Pests are: Aphid, Tobacco caterpillar and Flea beetles. **Disease are:** Root and crown rot, Cercospora leaf spot and Root knot nematode.

- ▲ Spray malathion 50 EC (2 ml/lit) for flea beetle and leaf webber.
- ▲ Spray Imidacloprid 200 SL (0.2 ml/lit) or methyl demeton 25 EC (2 ml/lit) or dimethoate 30 EC (2 ml/lit) for aphids.
- ▲ Applying neem cake @ 150 kg/ha for root rot.
- ▲ Foliar spray of Mancozeb 2.5 g / lit. for Cercospora leaf spot.
- ▲ Neem cake @ 1 t/ha or carbofuran @ 33 kg/ha as spot application on 30 days after sowing for nematode management.

Harvesting

Time: The tropical sugarbeet crop matured in about 5 to 6 months.

Maturity symptoms: The yellowing of lower leaf whorls of matured plant, Nitrogen deficiency and root brix reading of 15 to 18% indicate the maturity of beet root for harvest.

Harvesting should be timed so as the roots reach the factory within 48 hours for processing. Till such time the roots should not be harvested.

Post harvest management

- Stop irrigation 15-20 days prior to harvest. This allows sugar accumulation.
- Just hand pulling and keeping the tops, store in a shaded conditions.
- Roots of sugarbeet reach the factory within 48 hours for processing.

Yield

The average root yield of tropical sugarbeet is 80 –100 tonnes / ha.